COMMUNICATION EFFICIENCY

FIELD

[0001] The invention relates generally to wireless access networks.

BACKGROUND

[0002] There may be scenarios in which several wireless networks are overlapped with each other. This may happen, for example, in dense deployments of wireless network. Further, there may be cases where high efficiency up-to-date devices share the available spectrum with legacy devices.

BRIEF DESCRIPTION OF THE INVENTION

[0003] According to an aspect of the invention, there is provided a method as specified in claim **1**.

[0004] According to an aspect of the invention, there are provided apparatuses as specified in claim **10**.

[0005] According to an aspect of the invention, there is provided a computer program product as specified in claim **20**.

[0006] According to an aspect of the invention, there is provided a computer-readable distribution medium carrying the above-mentioned computer program product.

[0007] According to an aspect of the invention, there is provided an apparatus comprising means for performing any of the embodiments as described in the appended claims.

[0008] Embodiments of the invention are defined in the dependent claims

LIST OF THE DRAWINGS

[0009] In the following, the invention will be described in greater detail with reference to the embodiments and the accompanying drawings, in which

[0010] FIG. **1** presents a network according to an embodiment;

[0011] FIG. **2** shows a method according to an embodiment;

[0012] FIG. **3** shows that contention-free periods and contention periods may be used to offer communication capabilities to users, according to an embodiment;

[0013] FIGS. **4**A and **4**B illustrate some overlapping scenarios according to some embodiments

[0014] FIG. **5**A depicts an information element according to an embodiment;

[0015] FIG. **5**B depicts a proposal message according to an embodiment;

[0016] FIGS. **6** and **7** illustrate a scenario where contention period timings of different wireless networks are not aligned, according to an embodiment; and

[0017] FIG. **8** illustrates an apparatus according to an embodiment.

DESCRIPTION OF EMBODIMENTS

[0018] The following embodiments are exemplary. Although the specification may refer to "an", "one", or "some" embodiment(s) in several locations of the text, this does not necessarily mean that each reference is made to the same embodiment(s), or that a particular feature only applies to a single embodiment. Single features of different embodiments may also be combined to provide other embodiments.

[0019] The number of IEEE 802.11-enabled mobile devices is increasing. The IEEE 802.11 is a set of standards for implementing wireless local area network (WLAN), also known as the Wi-Fi. Such an IEEE 802.11-enabled station (STA), such as user terminals/equipment **102-108** in FIG. **1**, may associate and communicate with an access node/point (AP) **100**. The STA **102-108** may comprise a mobile phone, a palm computer, a wrist computer, a laptop, a personal computer, or any device capable to access the wireless radio access network, such as the WLAN. The access node **100** may be a WLAN (IEEE 802.11) access point (e.g. Wi-Fi base stations), for example.

[0020] As the use of WLAN is becoming more common, it may be important to provide high communication efficiency also in dense operating environments. As one option, a study group for a High Efficiency WLAN (HEW) has been set up. The HEW focus on improving the spectral efficiency to enhance the system throughput. Further, so called contention-free operation may be used to avoid channel access time waste due to back-off duration. As a result, contention-free devices **102-104** marked with solid lines may advantageously benefit from applying the contention-free techniques. However, full contention-free operation mode may not provide a solution for the coexistence of legacy devices **106-108** marked with dashed lines, even though the support to legacy devices **106-108** is one of the key points for the implementation of a contention-free Wi-Fi operation.

[0021] In general, contention-based techniques may be inefficient in terms of resource management because they waste channel access time during back-off periods and during the contention. For example, even with some of the up-to-date channel access techniques, such as the distributed coordination function (DCF), the point coordination function (PCF), the Hybrid Controlled Channel Access (HCCA), and the power-save multi-poll (PSMP), a fair amount of time is wasted in contention between overlapped basic service sets (OBSSs), especially with dense Wi-Fi deployments. According to the contention-free mechanisms, efficient communication takes place during the contention-free periods, during which the channel access may be determined by the APs **100**. However, even if the contention-free techniques are able to enhance the overall network throughput, one challenge in their use for Wi-Fi deployments may be to provide support for legacy devices **106-108**, which may not be able to operate in such contention-free networks. In other words, the legacy STAs **106-108**, which operate according to a contention protocol, may need to be supported as well.

[0022] Accordingly, there is provided a solution for supporting legacy devices **106-108** operation among overlapping contention-free mode APs. This may be achieved by synchronizing the APs of overlapping BSSs operating in the contention-free mode, so that a common time window (known as a contention period) is created to support legacy stations **106-108** in the overlapped wireless network. The created common time window may be separated from the contention-free periods in the overlapped network. Moreover, owing to such synchronization, the legacy STAs **106-108** need not interfere with the "high efficiency non-legacy STAs" (i.e. the contention-free capable, up-to-date devices **102-104**) that operate during the contention-free periods.

[0023] The AP **100** of the first wireless network may, in step **200**, detect that at least one overlapping second wireless network is configured to apply contention periods (CPs, also known as legacy periods (LPs)) and contention-free periods